Remarks

Objections to the Claims

Claims 14-19 were objected to due to misnumbering. Applicants have amended the claims to renumber claims 14-19 as claims 13-18 and to correct the dependencies in these claims, as necessary.

Rejection Under 35 U.S.C. § 112, second paragraph

Claims 7 and 8 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicants respectfully traverse this rejection to the extent that it is applied to the claims as amended.

The Examiner requested clarification regarding whether the phrase "the surface" referred to the "substrate" or to the "surface-chemical gradient". Although Applicants believe that claims 7 and 8 as originally filed clearly indicated that "the surface" referred to the surface of the substrate, claims 7 and 8 have been amended to explicitly refer to the "the surface of the substrate." Thus claims 7 and 8 are clear and definite.

Rejection Under 35 U.S.C. § 102

Claims 1-4, 7, 8, 12, 13, and 15-18 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,770,323 to Genzer *et al.* ("Genzer"). Applicants respectfully traverse this rejection to the extent that it is applied to the claims as amended.

Genzer

Claims 1-4, 7, 8, and 12

Genzer discloses forming a gradient on a surface by exposing the surface to a vapor containing a component to be adsorbed onto the surface and deforming the surface. Although Genzer uses the broad term "fluid", all of the methods described in Genzer involve exposure to a vapor, not to a solution, as required by independent claim 1. For example, at column 8, lines 22-52, a section cited by the Examiner (Office Action mailed February 12, 2007, page 4, line 3), Genzer describes a method for forming a gradient of the component in one direction along a surface, which requires providing a ***vapor*** source that contains the component to be adsorbed. Genzer explains, "As the component 15 evaporates and diffuses in the vapor phase, it generates a gradient of concentration that decreases along the axis C--C of the elongation of the surface 12. [...] Thus, surface portions closer to the vapor source 20 will receive greater deposits of the component and surface portions farther from the vapor source will receive lesser deposits of the component." (Genzer, col. 8, lines 33-44) This method could only be used with a vapor, and could not be used with other "fluids", such as liquids.

Genzer contains limited disclosure with respect to using liquids. With respect to applying a liquid to the surface, Genzer discloses ***homogenously*** depositing the component on the surface, such as by using "a uniform concentration vapor atmosphere or a liquid bath" (col. 12, lines 50-51). In another embodiment, Genzer discloses applying one component using vapor deposition and a second component by dipping the surface in a liquid bath (*see* col. 14, lines 36-41). In

contrast, claim 1 requires exposing a substrate to an advancing front of a first solution which contains a first adsorbate, and exposing the surface of the substrate to the first solution for a time period sufficient to adsorb the first adsorbate onto the surface of the substrate in an amount decreasing in concentration from a first area on the substrate to a second area on the substrate. Genzer does not disclose the claimed method. Therefore claim 1 and its dependent claims, claims 2-4, 7, 8, and 12, are novel in view of Genzer.

Claims 13 and 15-18

Independent claims 13, 15 and 16 have been amended to specify that the surface gradient is radially symmetrical. Support for this amendment can be found in the specification at least at page 5, lines 5-6.

Genzer does not disclose the formation of radially symmetrical gradients. Therefore independent claims 13, 15 and 16, and dependent claims 17 and 18, are novel in view of Genzer.

Rejection Under 35 U.S.C. § 103

Claim 10 was rejected under 35 U.S.C. § 103(a) as being obvious over Genzer, in view of U.S. Patent No. 6,242,264 to Natan *et al.* ("Natan"). Claim 11 was rejected under 35 U.S.C. § 103(a) as being obvious over Genzer, in view of U.S. Patent No. 5,656,034 to Kochersperger et al ("Kochersperger"). Applicants respectfully traverse this rejection.

Legal Standard

When applying 35 U.S.C. § 103, the following tenets of patent law must be adhered to:

(a) determining the scope and contents of the prior art;

(b) ascertaining the differences between the prior art and the claims in issue;

(c) resolving the level of ordinary skill in the pertinent art; and

(d) evaluating evidence of secondary considerations.

Graham v. John Deere, 383 US 1, 17-18, 148 U.S.P.Q. 459, 467 (1966). These four factors are traditionally referred to as the Graham factors.

The Graham factors were recently affirmed by the U.S. Supreme Court in *KSR International Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 82 U.S.P.Q.2d 1385 (2007). In its analysis of the obviousness standard, the Court did not totally reject the Federal Circuit's prior use of "teaching, suggestion, or motivation" as a factor in the obviousness analysis. Rather, the Court recognized that a showing of "teaching, suggestion, or motivation" to combine the prior art to meet the claimed subject matter may provide a helpful insight in determining whether the claimed subject matter is obvious under 35 U.S.C. § 103(a).

The Court also warned against the use of hindsight analysis in making an obviousness determination. The Court stated, "A factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning." *KSR*, 127 S. Ct. at 1742, citing *Graham*, 383 U.S. at 36 (warning against a "temptation to read into the prior art the teachings of the invention in issue" and instructing courts to "'guard against slipping into the use of hindsight'" (quoting *Monroe Auto Equipment Co. v. Heckethorn Mfg. & Supply Co.*, 332 F.2d 406, 412, 141 U.S.P.Q. 549 (6th Cir. 1964))).

In response to the *KSR* decision, the Deputy Commissioner for the USPTO issued a memorandum stating: "[I]n formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." Memorandum from Margaret A. Focarino to Technology Center Directors (May 3, 2007).

Claim 10 is nonobvious in view of the combination of Genzer with Natan

Claim 10 depends from claim 1 and specifies that the surface of the substrate is exposed to the first solution using a linear-motion drive.

Genzer

As noted above, Genzer does not disclose the claimed method for preparing a surface-chemical gradient on a substrate. Genzer focuses on vapor deposition methods. In fact, Genzer generally teaches away from using liquids to form chemical gradients, noting that prior techniques "are typically rather cumbersome and involve various 'wet chemistry' surface treatments, which is [*sic*] often times hard to control and not applicable to all materials." (Genzer, col. 1, lines 59-62) Further, Genzer explains that its goal is to "develop methods that would both eliminate the 'wet chemistry' environment and produce surfaces with reproducible and tunable surface properties." (col. 1, lines 62-65)

Natan

Natan discloses methods for forming self-assembled metal colloid monolayers on organics substrates (*see e.g.* col. 1, lines 14-15; col. 3, lines 30-32). The substrate is modified by

first generating hydroxyl or oxide groups on the surface and then by polymerizing bifunctional organosilanes on the surface. Then the polymer-derivatized substrate is immersed into a solution of colloidal metal particles and surface assembly spontaneously occurs (*see* col. 3, lines 2-16). The self-assembling monolayers are not adsorbed onto the surface (see enclosed definition of "adsorption" from http://en.wikipedia.org/wiki/Adsorption). Further, Natan does not disclose forming surface chemical gradients.

Genzer generally teaches away from using liquids, i.e. 'wet chemistry' to form surface chemical gradients. Genzer provides only two embodiments in which a liquid could be used to form the gradient. The first embodiment forms a homogenous coating on the surface. No gradient is formed due to the exposure of the substrate to the liquid; rather a gradient is formed with the substrate is allowed to contract (*see* col. 12, lines 58-64 and Figures 4(c) and 4(d)). In the second embodiment vapor deposition is combined with dipping the substrate in a liquid to form multiple gradients. These methods are different from the claimed method.

Natan does not cure the deficiencies of Genzer. Natan does not disclose forming chemical gradients. Further Natan does not adsorb a component onto a substrate. Further, although Natan discloses the use of a motorized translational stage for immersion (*see* Natan, col. 40, lines 54-55), such a device would not serve any purpose with Genzer's vapor deposition methods. Finally, such a device would not serve any purpose with Genzer's elongation-immersion- contraction method, described above.

Therefore claim 10 is nonobvious over Genzer in view of Natan.

Claim 11 is nonobvious in view of the combination of Genzer with Kochersperger

Claim 11 depends from claim 1 and specifies that the surface of the substrate is exposed to the first solution using a syringe pump..

Genzer

Genzer's disclosure is discussed above.

Kochersperger

Kochersperger discloses a syringe pump designed for delivery of small volumes (*e.g.* 1 to 10 μl) at high pressure (abstract and col. 1, lines 10-13). Kochersperger's syringe pump is designed for micro-scale separations in analytical chemistry (col. 1, lines 6-13). Kochersperger does not disclose the formation of surface chemical gradients, nor the adsorption of a component onto a substrate.

As noted above, Genzer generally teaches away from using liquids, i.e. 'wet chemistry', to form surface chemical gradients. Genzer provides only two embodiments in which a liquid could be used to form the gradient. The first embodiment forms a homogenous coating on the surface. No gradient is formed due to the exposure of the substrate to the liquid; rather a gradient is formed with the substrate is allowed to contract (*see* col. 12, lines 58-64 and Figures 4(c) and 4(d)). In the second embodiment, vapor deposition is combined with dipping the substrate in a liquid to form multiple gradients. These methods are different from the claimed method.

Kochersperger does not cure the deficiencies of Genzer. Kochersperger does not disclose forming chemical gradients. Further Kochersperger does not adsorb a component onto a substrate. Further, although Kochersperger discloses a particular syringe pump, such a device would not serve any purpose with Genzer's vapor deposition methods. Finally, such a device would not serve any purpose with Genzer's elongation- immersion- contraction method, described above. It appears that the volumes delivered with Kochersperger's device are likely too small to be useful for forming chemical gradients on macroscopic surfaces.

Therefore claim 11 is nonobvious over Genzer in view of Kochersperger.

Allowance of claims 1-18, as amended, is respectfully solicited.

Respectfully submitted,

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